THE UNIVERSITY OF NEBRASKA

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THIRTY-THIRD ANNUAL REPORT

OF THE

# Agricultural Experiment Station

OF

NEBRASKA

Presented to the Governor February 1, 1920

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LINCOLN, NEBRASKA
U. S. A.

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# THE OFFICIAL ROSTER OF THE STATION

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*By an act of the Legislature of the State of Nebraska, approved and in effect February 15, 1899, the State Treasurer became *ex officio* custodian of the Experiment Station fund on and after July 1, 1899.

**Resigned.

***Detailed from Office of Dry Land Agriculture, United States Department of Agriculture, Washington, D. C.

## LETTER OF TRANSMITTAL

THE UNIVERSITY OF NEBRASKA

AGRICULTURAL EXPERIMENT STATION

*To His Excellency, S. R. McKelvie, Governor of Nebraska:*

Sir: In accordance with the act of Congress approved March 2, 1887, and the act of the General Assembly of the State of Nebraska approved March 31, 1887, establishing and regulating experiment stations, I have the honor herewith to submit the Thirty-third Annual Report of the Agricultural Experiment Station of Nebraska.

E. A. BURNETT,
*Director.*

January 29, 1920.

## GOVERNOR'S CERTIFICATE

STATE OF NEBRASKA, EXECUTIVE DEPARTMENT

Lincoln, February 1, 1920.

*Mr. E. A. Burnett, Director Nebraska Agricultural Experiment Station:*

Sir: I hereby acknowledge receipt of the Thirty-third Annual Report of the Agricultural Experiment Station of Nebraska.

SAMUEL R. MCKELVIE,
*Governor.*

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# THIRTY-THIRD ANNUAL REPORT

The work of the Nebraska Agricultural Experiment Station for the current year has been as follows:

The funds of the Station are obtained from three sources, namely: The Hatch and Adams appropriations are received from the Federal Government in amounts shown by the Financial Statement of this Report. In addition, certain funds appropriated for general University maintenance, set aside by the Regents for agricultural departments, are used for experimental work.

The last Legislature made an appropriation of $40,000 for experimental work for the biennium ending March 31, 1921. It also appropriated $10,000 for investigation in Animal Pathology; $10,000 for the State Entomologist, who is the Entomologist of the Experiment Station; $3,000 for the State Botanist, who is the Botanist of the Experiment Station in charge of Plant Pathology investigation.

## EFFECT OF PAST EXPERIMENTS UPON AGRICULTURAL PRACTICE

Owing to the fact that a rather complete summary of the result of experimental work was included in the last annual report, such description will be limited in this report to lines of work which were not mentioned the previous year or to new work which has recently been summarized. Those wishing to study the earlier work of the Experiment Station are referred to the Thirty-second Annual Report.

*Serum Production.*—The University serum plant was reopened November 1, 1918, after lying idle about two years. The reopening of this plant was in response to a request from farmers' organizations, resulting from a lack of ability to secure serum from private companies. Hog prices were very high at that time, considerable cholera existed in the country, and the necessity for an additional supply of serum was imperative. The plant actually began to produce serum about January 1, 1919, and continued to run at almost full capacity until August 1, following, during which time it produced approximately 4,500,000 cubic centimeters of serum. One

thousand and fifty-seven immune hogs were used, averaging 275 pounds in weight. For the production of virus, 1,592 cholera-susceptible pigs were used, ranging from 50 pounds to 125 pounds in weight. Six hundred and twenty-five pigs were used in testing serum for potency. Up to December 1, 1919, 500,000 cubic centimeters of serum had been sold, leaving a balance on hand of 4,000,000 cubic centimeters.

Ten to twelve men were employed in the plant while operating at maximum capacity. On August 1, the amount of serum on hand being considered sufficient, we began to close down the plant and limit our activities to the testing of serum produced. At the present time, the persons employed in the plant are limited to one superintendent, one foreman and one stenographer.

This serum was produced at a time when hogs and foodstuffs were bringing maximum prices and other costs were high, much of it from hogs costing from 20 to 25 cents per pound, cholera-susceptible pigs of light weight being especially high priced.

Serum was sold at $1.50 per 100 cubic centimeters up to September 1, 1919, and since that date at $1.25 per 100 cubic centimeters.

The demand for serum for the year 1919 has been below normal. The most important factor affecting demand was the heavy decline in the hog market, which destroyed the demand for feeder pigs. A short pig crop in the spring of 1919 and a minimum of cholera in the country also affected the demand.

It is probable that the price of serum will be still further reduced in the near future, in order to bring our prices more in line with prices from commercial plants. Although the Serum Plant was opened at the request of live stock producers in order to insure a supply of serum for the County Farm Bureaus and thereby to protect the live stock industry, these Bureaus have made only small purchases from the University Serum Plant. On account of being able to secure lower prices, they have contracted with private companies, and this accounts in part for the small demand for serum from this plant. The present plant is not sufficiently modern to compete with large private concerns with up-to-date plants.

*Plant Pathology.*—The present lines of investigation have to do largely with potato diseases, smuts and rusts of cereal crops, and diseases of orchards and horticultural crops. The pathologist in charge of this work has recently resigned and his successor is not yet appointed. It is expected, however,

that this work will continue, practically along the lines of previous years, the pathologist in charge to devote his studies and investigations to plant diseases which directly affect the economic production of Nebraska crops, with a view to the suppression or control of such diseases.

*Winter Wheat.*—Definite progress has been made in the improvement of the standard variety of winter wheat (Turkey Red) which is almost universally grown in the State. Seed of two improved selections of this variety (Nebraska No. 6 and Nebraska No. 60) has been placed in the hands of Nebraska farmers in co-operative tests. Twelve years' testing of these strains at the Experiment Station, where they have surpassed the common Turkey Red wheat by about five bushels per acre, justifies confidence in their superiority. The demand for these new wheats is greater than the supply. The Station will be prepared to distribute a large quantity of this seed next summer.

*Oats.*—Nebraska No. 21 oats, which originated at this Station, as a selection of the common Kherson variety, is continuing to maintain its superiority. In twenty-five co-operative tests in 1919 with farmers in various sections throughout the State, this new selection made an average yield of eight bushels more per acre than the local seed growing beside it. There is a great demand in the State for seed of this new oats and the Station has undertaken to meet the demand both by growing a surplus and by preparing a list of farmers who have available seed. Nebraska No. 21 oats is white in color, which distinguishes it from the yellow Kherson, from which it originated.

*Corn.*—During the past two years, seed corn from five eastern Nebraska counties, four central Nebraska counties, and two western Nebraska counties was compared, for yield, at the central Station, at Lincoln. The comparative yields for the three groups were respectively: eastern counties, 59.8 bushels; central counties, 46.2 bushels; western counties, 31.6 bushels. In a two-year test where two local varieties were compared with eight varieties imported from other states, the average yield of the imported seed was 10 bushels less than the local seed. The yields of the two groups were 65 bushels for local seed, 55 bushels for imported seed. This still further emphasizes the statement made some years ago against the importation of seed corn from distant sections. Experiments of some years ago, in which seed from eastern Nebraska was carried to central Nebraska at the North Platte Station, showed that such eastern Nebraska seed could not safely be grown as far west as Lincoln county. Tests of this sort are so numerous

and the necessity of using locally grown seed has been so often proved that every farmer should be thoroughly familiar with the facts and should understand the advantage of locally grown seed. Alluring descriptions in seed catalogues should not tempt the farmer to bring seed corn from distant regions in the hope that he will secure greater yield or superior varieties. The large yield of the rich lands in eastern states is the best indication that these varieties are not suitable for the drier climate of Nebraska and that where used the farmer is likely either to suffer from drouth or to find the variety so late it will not mature. This principle applies with equal force to prevent the seed corn of eastern Nebraska being used in the western part of the State.

*Potato Selection for Seed Purposes.*—Dry-land western Nebraska seed potatoes grown in several southern states have shown that Nebraska-grown potatoes are superior to those of many sections in other states which now furnish large quantities of seed potatoes for commercial planting. During the winter of 1918-1919, Triumph seed potatoes from the three dry-land farms and three irrigated farms in western Nebraska were sent to nine trial stations in southern states. These trial stations were located in Kansas, Oklahoma, Texas, and Louisiana. The tests were carried on in co-operation with the Bureau of Plant Industry of the United States Department of Agriculture. In addition to this test, potatoes of the Early Ohio, Triumph, Irish Cobbler, and Pearl varieties were sent for trial to Texas, Missouri, Kansas, and eastern Nebraska. The seed for all these tests was produced in northwestern Nebraska. The results indicate that western Nebraska potatoes are as good for seed purposes as those from the states of Michigan, Wisconsin, Minnesota, and North Dakota. In many instances the western Nebraska potatoes were superior. Seed grown upon dry land was decidedly superior to seed grown under irrigation. While some lots of irrigated potatoes gave satisfactory yields, the results to date indicate that potatoes produced under irrigation are more apt to produce weak, low-yielding strains than potatoes grown without irrigation.

Ten standard varieties of potatoes are being grown at Lincoln, Nebraska, and at twelve places in western Nebraska with a view of determining what varieties are best adapted to the several localities.

A study of "degeneracy in potatoes" has been in progress at twenty different places in western Nebraska. The tuber units originating from dry-land stock remain constantly high

or low yielding in accordance with the performance of the previous year. The selection of high-yielding strains makes it possible to eliminate very quickly low-yielding strains and greatly increases the yield per acre where tillage and moisture conditions are suitable.

## POULTRY

The poultry plant at the Station has been greatly extended within the past year. The poultry colony now includes about 560 laying hens of five breeds as follows: Single Comb White Leghorns, Barred Plymouth Rocks, White Wyandottes, Buff Orpingtons, and Single Comb Rhode Island Reds.

Investigations have been carried on in feeding to secure early maturity as a basis for selecting high producing hens, as follows:

Fifty-eight pedigreed pullets sired by three males were trap-nested for a full year. Data collected incident to pedigreeing make it possible to determine accurately the age of each pullet at time of laying the first egg. The age at time of laying first egg is taken as an indication of maturity of each bird. All birds were given the same feed and care and had equal opportunity in so far as management factors were under our control.

Production of 109M Pullet Progeny (S. C. W. Leghorn)
First Laying Year

8 pullets laying before 200 days old averaged 204.25 eggs.
12 pullets laying first egg at ages between 200 and 220 days averaged 190.4 eggs.
2 pullets laying first egg at ages of 221 days or over averaged 184 eggs.

Production of 72M Pullet Progeny (S. C. W. Leghorn)
First Laying Year

9 pullets laying before 200 days old averaged 200.8 eggs.
6 pullets laying first egg at ages between 200 and 220 days averaged 180.9 eggs.
3 pullets laying first egg at ages of 221 days or over averaged 166.7 eggs.

Production of Pullet Progeny of 01244 (Barred Rock)
First Laying Year

5 pullets laying before 230 days old average 205.2 eggs.
13 pullets laying at ages of 231 days or over averaged 183.8 eggs.

The data presented tend to show that early maturity and high average productive ability are quite closely correlated.

The time of hatching as a factor influencing egg production has also been studied in considerable detail. The average first year's production of six March hatched pullets was 199.5 eggs. The average first year's production of sixteen April hatched pullets was 195.0 eggs.

As an indication of the relative rate of maturity of different breeds, the age of pullets when they laid their first egg was studied in the three following breeds:

Single Comb White Leghorns, forty-four pedigreed pullets, laid first egg at average age of 205.5 days.

Barred Rocks, thirty pedigreed pullets, laid first egg at average age of 239.2 days.

Single Comb Rhode Island Reds, twenty-eight pedigreed pullets, laid first egg at average age of 250 days.

A study of some of the factors affecting palatability of poultry feeds was made as follows:

Typical healthy hens of the Rhode Island and White Leghorn breeds were confined in individual cages for twenty-four hours without feed and were then offered various feed mixtures during a feeding period of twenty minutes each day. Each test was continued for three days and an average of the amounts consumed was taken as indicative of relative palatability. Birds on this test were put on normal rations in a large yard every six or seven days so as to maintain a normal appetite.

Corn meal was used as a basal ration. This was fed moist, normal, acidified with acetic acid, sweetened with sugar solution, made bitter with Epsom salts and with common salt. Conclusions are that palatability with birds is dependent on other factors than palatability in humans. Bitterness, sweetness, and similar factors apparently have but slight effect on palatability.

Previous investigational work has indicated to us that physical consistency has an important effect on palatability. As an example, whole rye is not palatable as a poultry feed. When ground rye is moistened, palatability is somewhat improved. Moist wheat bran in itself is not highly palatable but the mixture of ground rye and bran so improve the physical consistency of this ration as to make it quite palatable.

In order to study the inheritance of egg producing ability in poultry, representative hens of five of our most popular varieties of poultry (Single Comb Rhode Island Reds, Barred Plymouth Rocks, Single Comb White Leghorns, Buff Orpingtons, and White Wyandottes) are being trap-nested and the best layers selected for breeding purposes. These are being

mated to pedigreed males of known productive ancestry when they can be secured. Offspring are being pedigreed and the female progeny trap-nested. Data on age at first egg (indication of maturity), size and color of eggs are also being secured. Data on the egg production of 92 pedigreed and 160 non-pedigreed pullets were secured during 1918 and 1919.

This project is in the main a long time project and conclusions and comparisons can only be made after three or four more years' work. The following data summarizations show information that is being gathered on the production of each family:

| | | | Average | | |
|---|---|---|---|---|---|
| Dam | Sire | Number Daughters | Age at First Eggs | Production First 100 Days | Weight Eggs |
| A460 | 72M | 1 | 202 | 45 | 62 |
| A131 | 72M | 4 | 224 | 66 | 59.1 |
| A250 | 72M | 7 | 199.3 | 54.4 | 57.4 |
| A114 | 72M | 2 | 209.1 | 53.5 | 64.1 |
| A232 | 72M | 2 | 204 | 59 | 55.1 |

Summary of 72M: Average age of sixteen daughters at first egg, 208 days. Average production of sixteen daughters first 100 day laying, 57.1 eggs.

| | | | Average | | |
|---|---|---|---|---|---|
| Dam | Sire | Number Daughters | Age at First Eggs | Production First 100 Days | Weight Eggs |
| A26 | 109M | 2 | 204.5 | 68.1 | 54.1 |
| A28 | 109M | 6 | 194.4 | 51.3 | 59.1 |
| A23 | 109M | 2 | 215.1 | 54.1 | 63 |
| A185 | 109M | 2 | 201 | 47.5 | 58.5 |
| A56 | 109M | 2 | 203 | 45 | 56.5 |
| A39 | 109M | 1 | 213 | 66 | 58 |
| A168 | 109M | 2 | 202 | 60 | 55.5 |
| A21 | 109M | 3 | 208 | 60.4 | 56.1 |
| A36 | 109M | 2 | 209 | 70 | 58 |

Summary of 109M: Average age of twenty-two daughters at first egg, 203.4 days. Average production of twenty-two daughters first 100 day laying, 56.6 eggs.

## NEBRASKA NATIONAL EGG LAYING CONTEST

The Nebraska National Egg Laying Contest is directed and administered by the Nebraska Agricultural Experiment Station at Lincoln. The Director of the Experiment Station and the members of the Department of Poultry Husbandry constitute the Contest Staff.

Correspondence regarding the contest should be addressed to the Department of Poultry Husbandry, College of Agriculture, Lincoln, Nebr.

### Object of the Contest

To promote the breeding of high laying strains of standard bred poultry is the primary purpose of the Nebraska National Egg Laying and Breeding Contest. Data on the cost of egg production and on the problems of poultry breeding will also be secured.

### Effect on the Industry

The healthy interest which is stimulated by well-managed egg-laying contests is acknowleged by all those interested in the development of the industry. As a result of the experimental work of Pearl, Goodale, and other investigators, in the study of inheritance of egg production, poultry breeders have a practical working theory on which to base breeding operations for improvement in egg-laying ability. More attention must and will be paid to this quality in poultry breeding of the future. This does not mean, however, that less attention is going to be paid to standard qualities, for in fact these two qualities can be and are being developed in the same strains.

### Poultry Breeders' Interest in the Contest

Poultry breeders recognize the value of having trap-nest records of some of their best birds, but not all breeders are equipped to carry on this work through the whole year. Trap-nesting requires regular attention and careful record keeping in order to be of greatest value. Poultry breeders are quick to see the advantage of having a place to which a few of their very best standard birds may be sent for the purpose of securing an accurate trap-nest record of their egg production.

While it seems best to call this project a contest, yet the contest feature seems to us to be the least important part of the project. The breeder who makes an entry in the contest will learn that some of the birds in his entry have laid only 100 eggs, while others with the same care and management have produced perhaps 200 eggs. Constructive breeding for greater usefulness is possible when we have definite data on the actual production of each bird.

The advertising value to the breeder of having birds entered in the contest should also be considered. Monthly reports of

the results of the contest are distributed widely and farm and poultry journals give the results broad publicity.

### Location of the Contest

The Nebraska National Egg Laying Contest is located at Lincoln, Nebraska. A tract of five acres well located and well adapted to poultry keeping has been made available for the contest. The contest grounds are easily accessible by interurban and street railway service. Thousands of poultry raisers visit the University Farm at Lincoln each year and the location of the contest at this place is an additional attraction. The administrative offices of the contest are located in Rural Economics Hall near the contest grounds. The staff of the Department of Poultry Husbandry is responsible for the administration of the contest.

### Plan of the Contest

One hundred entries of ten standard-bred pullets each are accepted for admission to the contest. Each breeder is urged to send the most typical and best-colored birds of his variety that can be selected from his flock. Disqualified birds or birds of decidedly inferior standard quality are barred from competition. The management reserves the right to refuse any entry on these grounds.

The contest birds are housed in flocks of 200, birds of similar type and variety so far as possible being housed together. This arrangement permits a great saving of labor, housing expense, and fencing and gives a most practical demonstration of what a flock of good standard-bred hens can do. The relative egg production of birds kept under the same conditions will be available and the best birds of each entry will be selected for breeding stock for the development of strains of better layers.

It is hoped that the contest will develop into an institution of permanent value to the poultry breeders of the State and nation. A breeding project to be combined with the laying contest will form the basis for constructive breeding work. No obligation is assumed in agreeing to carry on the breeding project as outlined below, but preference will be given to breeders who signify a willingness to carry out the breeding program as far as practically possible.

The following breeding program is suggested:

First Contest (1919-1920)

Enter ten best standard pullets.

Second Contest (1920-1921)

Enter ten best standard pullets.

Home Work: Use two best hens from First Contest to mate to pedigreed cockerel to breed pullets for Third Contest.

Third Contest (1921-1922)

Enter ten best standard pullets from each of two high hens of the First Contest.

Home Work: Use best son of either one of high hens from First Contest to mate with two best hens from First or Second Contest to produce pullets for Fourth Contest.

Fourth Contest (1922-1923)

Enter ten pullets sired by cockerel from high hens of the First Contest. These birds will then be granddaughters of the best hens in the First Contest.

Fifth Contest (1923-1924)

Continue pedigree breeding as outlined, using males from high laying hens mated to highest laying hens as shown by the trap-nest.

In the breeding program here suggested it is expected, of course, that vigor and vitality will be the first object of selection with standard qualities and high egg production next in consideration.

Rules, Regulations, and Suggestions

1. This contest is known as the Nebraska National Egg Laying Contest.

2. The contest is held at Lincoln, Nebraska, and the Department of Poultry Husbandry of the Nebraska Agricultural Experiment Station has complete charge of the administration. All records secured become Experiment Station records. Monthly reports are issued giving a summary of the data. A more complete report of data on number of eggs laid, weight of eggs, labor, amount of feed consumed, broodiness, etc., is issued at the conclusion of each contest.

3. The contest begins November 1 each year and ends October 31 the following year.

4. Ten standard-bred pullets constitute an entry. Breeders may club together to make an entry, but all birds of one entry must be of the same breed and variety.

5. Smith sealed leg bands will be sent to each breeder on receipt of entry fee. One band should be placed on the right leg of each pullet in the entry. To facilitate reading of the

band number when bird is taken out of the trap-nest, the band should be placed so as to be upside down when the bird is standing.

6. All birds must be shipped by express prepaid. Birds should be consigned so as to arrive by October 20 if possible. All entries must positively be on hand by October 31.

7. The right to return inferior birds, birds suffering from contagious disease or lacking in natural vigor is reserved. Entry fee will be returned when this is done.

8. A fee of eighteen dollars ($18.00) is required for each entry. Eight dollars ($8.00) of this amount is to be paid at time of making entry and the balance before October 1 of each contest year.

9. At the end of each contest, birds are returned to their respective owners, together with a certified egg record. The average weight of ten eggs laid by each hen and selected at random are given as well as the weight of the hen at the beginning of the contest.

10. All eggs laid during the contest become the property of the Department of Poultry Husbandry and the proceeds from their sale as market eggs are applied to maintenance expense.

11. Every possible effort is taken to avoid loss or injury to birds by frosting, fire, disease, or other causes, but the management is not responsible for any losses which may occur.

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*Cost of Producing Staple Farm Products.*—The Station has undertaken to investigate the cost of producing staple crops based upon the payment of interest on the investment in land and equipment, and the current price for farm labor. The farmer's cost of producing has increased in about the same ratio as the cost of the manufacturer. The wages paid farm labor have more than doubled in the last five years. Farm machinery has also more than doubled in price. Oil, twine, and other miscellaneous costs have about doubled. Since the larger portion of land rents for a share of the grain, we may say that rent has increased at least as much as the price of the grain or hay.

The cost-of-production studies have shown that farmers are not receiving unreasonable profits, considering their investments. Nearly all farmers are receiving less per hour for their own labor than skilled city laborers. The farmer's family, particularly his sons who are under age, have helped to swell the profits by replacing high-priced hired labor. While farmers have been prosperous, it is mainly because they have worked

more hours per year than city laborers and have saved more through habits acquired when saving was a necessity. Nebraska farmers have specialized in production and as a result produce the staple crops at a low expenditure of labor per unit.

Although marketing is equal in importance to production, it has until recently received comparatively little attention from the farmers. Buying and selling organizations have developed in which the farmer has no interest. The farmer feels that the work of the distribution is not always performed as economically as it should be and as a result the producer receives too small a portion of the consumer's dollar. The Nebraska Experiment Station is studying methods of marketing and market costs in an effort to discover the most direct and cheapest methods of distribution. Where co-operative farmers' organizations have been undertaken and developed to assist the farmer in his market operations, the cost of distribution has frequently been materially lessened.

Many farmers are now keeping records of the farm business. An analysis of the records shows the relative profits made in definite branches of his business. A record of the farm business makes it possible to study the organization of the farm and eliminate those activities which are operated at a loss or to reorganize them so that they may produce a profit. Farm surveys have been made of many farms in Nebraska. These have helped the farmers by rearranging their business to increase profits. Bulletin No. 157, "Farm Management Studies in Eastern Nebraska," makes a survey of different types of farms with the profit or loss resulting in the area studied.

*Land Tenure.*—In a considerable number of Nebraska counties more than one-half of the land is now farmed by tenants and the proportion tends to increase. Under this system, soil fertility is wasted more rapidly than upon farms where the operator is also owner and is therefore interested in maintaining production. The Station is studying the effect of land tenure on soil fertility, the value of improvements on farms, and the character of schools and social institutions maintained in the country. It is hoped that more effective studies may be made along these important lines.

*Rodent Investigation.*—Work in controlling the ravages of the prairie dog and pocket gopher has been carried on for a number of years. Poison is now considered the most successful method of controlling either the gopher or the prairie dog, though traps are used for gophers with some success. For gophers, the poison is placed in their runways. For prairie

dogs, the poison is placed outside near the entrance to their holes. Where this work is carefully done, it is relatively easy to clear the field of either prairie dogs or gophers. Bulletin 154, on control of prairie dogs, has been issued. Bulletin 9 of the State Entomologist is on the control of pocket gophers.

The following formula is recommended by the Department of Entomology for pocket gophers: Cut some fresh vegetables, such as parsnips, sweet potatoes, carrots, potatoes, or sugar beets, into cubes which have a largest diameter of less than an inch, and when four quarts have been cut, wash and drain them and place them in a metal pan. Thoroughly shake together or grind together in a mortar one-eighth of an ounce of powdered strychnin, one-eightieth of an ounce of saccharin and one-eighth of an ounce of powered bicarbonate of soda (common baking soda). The saccharin and soda are added to disguise and delay the bitter taste of the strychnin. Sift the mixture from an old pepper box or a similar finely perforated receptacle over the freshly cut and dampened baits, stirring the cut vegetables constantly so as to distribute the poison evenly. Distribute immediately, dropping a couple of cubes into each burrow.

The following formula is recommended by the Department of Entomology for poisoning prairie dogs: Mix thoroughly one ounce of powdered strychnin (alkaloid) and an ounce of common baking soda (sodium bicarbonate). Dissolve one heaping tablespoonful of dry laundry starch in a little cold water and add it to three-fourths of a pint of boiling water. Boil and stir until a thin clear paste is formed. Slowly sift the mixture of strychnin and soda into the starch paste, stirring constantly to form a smooth, creamy mass. Add one-fourth pint of heavy corn syrup and one tablespoonful of glycerine, and stir. Add one-tenth of an ounce of saccharin, and again stir thoroughly. Pour this mixture while still hot over thirteen quarts of clean oats and mix until all the grain is coated.

Each quart of the prepared grain is sufficient to treat fifty prairie dog burrows. Scatter the grain on clean, hard ground near the mounds or burrows, never on loose soil or in the holes.

*Control of Injurious Insects.*—The work inaugurated in 1918 for the control of grasshoppers in the irrigated section of the North Platte valley was continued in 1919. Poison baits were mainly used. The work in the North Platte valley was considered very successful.

During June, 1919, the variegated cutworm became very bad in many alfalfa fields in southeastern Nebraska. A cam-

paign was put on to control and destroy these worms with poisoned bait. The results were very encouraging, in many cases the eradication being so complete that there was no further damage.

The following formula is recommended for poisoning variegated cutworms: Thoroughly mix together dry in a tub twenty pounds of coarse-flaked wheat bran and one pound of Paris green or white arsenic. Thoroughly stir into this with a wooden paddle one-half gallon of cattle molasses or cheap sorghum and the juice and ground up pulp and rind of six lemons in a sufficient quantity of water, about three gallons, to make a wet but not sloppy mass of the whole. Apply to the infested fields, while fresh, during the late afternoon or evening by sowing it broadcast and scattering it as evenly as possible, so that the above amount will cover four or five acres.

## TECHNICAL INVESTIGATIONS

The following lines of technical investigation are in progress at the Station. Some of these lines have been carried for a number of years.

### Adams Projects

No. 5, The Study of Nummularia Discreta, as the Cause of the Blister Canker of Apple. Its Prevention and Control.
No. 6, The Study of the Anatomy of the Potato Plant.
No. 8, A Study of the Chemical Factors Concerned in the Formation of Pigments in Certain Varieties of Corn.
No. 9, A Study of the Formation and Persistence of Prussic Acid in Kafirs and Sweet Sorghums.
No. 11, Corn Breeding Experiments.
No. 12, Water Requirements of Crops.
No. 13, Competition in Cereals.
No. 15, Food Requirements of Growing Cattle.
No. 16, Winterkilling Investigations.
No. 62, Chemical Studies on Silage.
No. 67, The Life-History of Wheat-Infesting Sawflies.
No. 69, The Life-History of Several Common Cutworms.
No. 72, Physiological Studies in the Formation of Silage.
No. 85, Protein Requirements for Growing Cattle.
No. 86, An Inquiry into the Nature of Necrobacillosis in Young Pigs.
No. 87, A Study of the Pathogenicity as well as the Antigenic and Biologic Properties of the Organisms Belonging to the Hemorrhagic Septicemia Group.

Hatch and State Projects

No. 19, Variety Testing, Breeding, Acclimitization and Cultural Studies with Small Grains.
No. 21, Soy Bean Tests.
No. 22, Crop Rotation and Fertilizer Experiments.
No. 26, Investigation and Control of Injurious Insects, Mammals, and Birds.
No. 28, Spraying Apples, Pears, Grapes, and Bush Fruits.
No. 29, Pruning Apples, Pears, and Small Fruits.
No. 30, Principles of Orchard Culture.
No. 31, Hill Selection of Potatoes.
No. 32, Home Production of Seed Tubers.
No. 33, Fruit Breeding.
No. 34, Corn Silage vs. Alfalfa Hay as Feeds for Milk Production.
No. 36, A Study of the Soiling System under Nebraska Conditions.
No. 37, A Co-operative Study of Dairying under Conditions of Western Nebraska.
No. 38, A Study of the Underlying Factors Necessary for the Operation of a Successful Co-operative Creamery.
No. 39, Factors Affecting the Efficiency of Hand Separators and Causes of Variation in Cream Tests.
No. 41, Fattening Cattle.
No. 42, Farm Survey.
No. 43, Farm Survey.
No. 45, Hog House Investigations.
No. 47, Pump Irrigation.
No. 48, Nursery and Orchard and Nursery and Greenhouse Stock Inspection, under State Law.
No. 49, Serum Production.
No. 63, The Organic Constituents of Soils.
No. 64, Sweet Clover Hay vs. Alfalfa Hay as Feeds for Milk Production.
No. 65, Rations for Fattening Lambs.
No. 66, A Study of the Efficiency of Various Types of Cream Cooling Tanks.
No. 68, The Relation of the Colloidal Properties of Gluten to Problems of Milling and Baking.
No. 70, Plant Breeding.
No. 71, Lamb Feeding.
No. 73, Farm Survey Based on Agricultural Census.
No. 74, Direct Marketing in Car Lots.
No. 75, Nebraska Tractor Tests, 1917.
No. 76, To Improve Dairy Cows by Grading Up with Pure Bred Sires.

No. 77, Grasses and Grass Mixtures for Pasture Purposes.
No. 78, Rations for Fattening Sheep.
No. 79, Rations for Fattening Hogs.
No. 80, Potato Selection for Seed Purposes.
No. 81, Tuber Line Selection of Potatoes for Increased Yields.
No. 82, A Study of the Inheritance of Egg Production.
No. 83, The Essentials in a Ration for Baby Chicks.
No. 84, Cost of Milk Production in Nebraska.
No. 88, Cost of Fattening Cattle and the Relation of the Enterprise to the Farm Business.
No. 89, Farm Tenure.
No. 90, Orchard Culture.
No. 91, Egg Production.
No. 92, Cost of Producing Farm Products.
No. 93, Marketing Nebraska Potatoes.

## WORK AT OUTLYING PLANTS

The State makes direct appropriations for the maintenance of Substations at North Platte, Valentine, and Mitchell, Nebraska, and the school of Agriculture at Curtis. There are also two outlying farms—the Agronomy Farm, which lies about three miles northeast of the main Station at Lincoln, and the Fruit Farm at Union, Nebraska. Plans for the work at these outlying plants are prepared at the beginning of the calendar year, covering the lines of investigation proposed for the current year, so that the work may progress systematically, in accordance with approved plans.

### THE AGRONOMY FARM

The Agronomy Farm, purchased in 1918 in accordance with an appropriation by the previous Legislature, has been developed and equipped for experimental work. The shortage of labor available for experimental purposes, both at the central plant and at all the outlying plants, has made it difficult to develop new work and lay out permanent systems of investigation which require large amounts of technically trained labor. Plans have been developed by which a series of rotation and fertilizer plats will be laid out upon this farm during the year 1920. A superintendent will be placed in charge and the technical work which has been delayed by lack of available labor will be installed. This delay in subdividing the land has been advantageous in that it has permitted uniform crops to be grown upon all the land for the last two years. The same practice will be followed for the season of 1920, before the land is subdivided into plats.

Sixteen and one-half acres of land has also been added to this farm by the purchase of a plat of land lying north of the west half of the original farm between this farm and the C. R. I. & P. railroad, officially described as follows: "Beginning at the northwest corner of the southwest quarter of Section 10, Township 10, Range 7, running thence north 557.6 feet to the south line of the right-of-way of the C. R. I. & P. railroad, thence east 300 feet, thence south 50 feet, thence east to the east line of the west half of said southwest quarter, thence south along said line to the northeast corner of the west half of said southwest quarter, thence west to the place of beginning." This land was very desirable, since it brings the farm up to the railway right-of-way and permits platting the entire west frontage of the farm for experimental work.

This farm has been equipped with live stock, tools, and machinery. A new residence and a machine shed have been built. It will be necessary further to improve this farm by building outside fences and rebuilding the horse barn, hay barns, and granary so that they will be more suitable for experimental purposes.

## THE FRUIT FARM

The Fruit Farm at Union, Nebraska authorized by the previous Legislature, has been improved as much as could be done without a resident foreman. In the spring of 1918, a forty-acre orchard was set on this farm, the balance of the farm being leased and the care of the orchard supervised by the Department of Horticulture from Lincoln. This condition was repeated for the season of 1919.

An appropriation was made by the Regents for the current year with which to erect a dwelling house and barn, provide machinery and equipment, and develop the farm so that it could be placed in charge of a resident foreman under the Chairman of the Horticultural Department. The buildings are approaching completion and will be ready for occupancy about March 1, 1920.

It is planned to operate this farm so that the proceeds of the farm will largely pay the cost of operation up to the time when the orchard comes into bearing. After that time it is expected the farm will actually produce a revenue on the investment over and above the cost of maintenance. Commercial varieties of apples have been planted and the entire plant is to be operated as a demonstration to show the possibility of

developing the suitable lands of southeastern Nebraska for commercial orchard purposes.

The following varieties have been set in the permanent orchard:

| | |
|---|---|
| Jonathan | 430 trees |
| Winesap | 430 trees |
| Delicious | 172 trees |
| Wealthy | 172 trees |
| York | 172 trees |
| Virginia Beauty | 86 trees |
| Black Twig | 86 trees |
| Grimes Golden | 86 trees |
| Stayman | 86 trees |
| Total | 1,720 trees |

The following varieties have been set as "fillers," to be removed when they interfere with the permanent trees:

| | |
|---|---|
| King David | 200 trees |
| Missouri Pippin | 200 trees |
| Duchess | 126 trees |
| Wealthy | 105 trees |
| Stayman | 84 trees |
| Grimes Golden | 84 trees |
| Total | 799 trees |
| | 1,720 trees |
| Grand total | 2,519 trees |

## THE NORTH PLATTE SUBSTATION

The operations of the Station have been at a minimum during the past year, due to our inability to secure farm labor in sufficient quantity and of sufficient efficiency to conduct experimental work in a satisfactory manner. The crop and tillage work has been continued as formerly and several other lines have been advanced, but feeding experiments with hogs and cattle have been very much curtailed.

*Agronomy.*—The greater part of the crop rotation, cultural, fertility, rate and date of seeding and crop variety experiments were continued as in the past.

Ten years' work in dates of seeding and comparative yields of spring grains was brought to a close and the results pub-

lished as Bulletin 172. Early seeding was shown to be more profitable than late seeding. Of the crops grown, barley was the most and emmer the least productive, while oats and wheat occupied intermediate positions. This work is being continued with spring rye substituted for emmer.

Eight years' results in depth of plowing for winter wheat are being summarized for publication and the work discontinued, as no benefits have been derived from plowing to a greater depth than seven inches.

This year, Nebraska Hybrid No. 28 was the highest yielder in winter wheat, producing 25.6 bushels per acre, leading Kanred, its nearest competitor, by 5.6 bushels and Turkey Red by 7.8 bushels. The earliness of Hybrid No. 28 was a distinct advantage this year, as it allowed this variety to escape in some degree the rust, which caused great damage to later varieties.

Among spring wheat varieties, the Durum wheats averaged 15.4 bushels per acre, while common varieties averaged but 9.4 bushels per acre. In this case, the greater rust resistance of the Durum wheats was again an important factor.

The most accurate comparison afforded between winter and spring wheat indicated an increase of 23 per cent of the former over the latter.

Land on the bench summer tilled in 1918 produced 24.1 bushels of winter wheat per acre, while a part of the same field which grew corn in 1917 produced 16.7 bushels per acre. On the table the yields from these two methods of preparation were 26.1 and 22.2 bushels per acre respectively.

Irrigated fields produced 11 tons of silage per acre, while fields not irrigated produced 5.1 tons per acre. Fall irrigation for winter wheat increased the yield from 23.3 to 37.5 bushels per acre. Irrigated sugar beets and stock beets yielded respectively 13 and 24.5 tons per acre.

*Forestry.*—The trees planted during the past years are giving quite encouraging results on the whole. Some of the less hardy varieties have died while some of the more hardy have made very fair growth. The cottonwood and box elder still give evidence that they have a place in every planting on account of their hardiness and fast growth. The White Elm, Honey Locust, Hackberry and Russian Olive are the leaders among the more permanent hardy trees. The conifers, while difficult to start, are worthy of more attention. The Bull Pine, Jack Pine, and Black Hills Spruce, as well as other varieties give a reasonably rapid growth and give promise of great value for windbreaks and ornamentation. What other value they may

have the future will record. The Wild Buffalo Berry grows at a fair rate and makes a very effective windbreak.

*Fruits, Shrubs, and Flowers.*—The results secured from the perennial plants that have to do with home building are quite encouraging. Cherries and plums yield abundantly. Apples have been grown without irrigation. There is some promise that apples may be grown successfully for home use where the soil is properly tilled and modern methods of spraying followed. Small fruits, such as currants, gooseberries, and strawberries do very well. The strawberry is not successful every year unless irrigated. There are many hardy shrubs that are entirely successful. Among these are the Bridal Wreath (Spirea Van Houti), Tartarian and other honeysuckles, Mock Orange, Lilac, Siberian Pea Tree, Buckthorn, Cut Leaf Sumac, Golden Elder, Tamarisk, and many others. The tulip, peony, hollyhock, and dahlia are among the most easily raised flowers.

*Dairy.*—The development of a dairy herd has progressed satisfactorily. Several undesirable cows have been disposed of, but heifers produced in the herd have taken their places. The herd now contains 30 pure-bred females, besides a large number of very good grades. Several bulls have been distributed thruout the State where they should increase the production of the herds in which they are used. There are several fine cows in the herd. G and B Segis Pledge Rose produced 900 pounds of butter in 305 days. She has three daughters in the herd, one son at the head of another herd, and another son ready to head a herd.

*Beef Herd.*—During the past year a Shorthorn herd was established by the purchase of a bull and nine cows with five calves at side. These are good individuals and should form the basis for the development of a very creditable herd.

*Cattle Feeding.*—In one test, 25 two-year-old white face grade steers were kept 80 days during the winter on a ration of wheat straw with one pound per head daily of cottonseed nut cake. The steers used about 15 pounds of straw each daily. They maintained their weight on the ration.

*Poultry Plant.*—A poultry plant has been established and put into operation, with a capacity of 1,000 hens and 2,500 to 5,000 chicks. The plan embraces five poultry houses, 20 by 40 feet, six colony houses 10 by 14 feet, a feed house 24 by 32 feet, with 12 acres of land properly fenced into yards, and a modern stucco-hollow-tile cottage 26 by 34 feet. The basement of the

cottage provides space for a 2,400 egg incubator. The larger part of the construction work has been completed. The plant as planned should be completed early in the summer of 1920.

## THE SCOTTSBLUFF SUBSTATION

Weather conditions on the North Platte irrigation project during the summer 1919 were unfavorable for crop production both under irrigated and dry-land conditions. The spring was so dry that many crops failed to germinate satisfactorily without irrigation. Where crops were irrigated up much difficulty was experienced with soil washing and soil blowing. Thousands of acres of sugar beets were re-seeded or planted to other crops.

The grasshoppers were extremely bad and did considerable damage. The beet webworm was also very numerous, but was checked by spraying beet fields with Paris green. The spraying was very effective so that little damage was caused from worms. Practically all of the beet fields in the valley were sprayed.

*Crop Rotations Under Irrigation.*—In the irrigated rotation work there are nine plats of continuous cropping, eleven 2-year rotations, three 3-year rotations, four 4-year rotations and four 6-year rotations. Several of these rotations are duplicates with the exception of an application of twelve tons of manure per acre on one test.

The most striking facts brought out by these rotation experiments are: (1) Low yields from continuously cropped plats; (2) poor grade and extremely scabby potatoes from short rotations; (3) superiority of fall seeding of alfalfa in grain stubble compared with seeding alone in the spring. When grasshoppers are extremely bad fall seeding is not always successful. (4) Beneficial effects of barnyard manure and residual effects of alfalfa are very apparent. Twelve tons of manure per acre increased the yield of beets from five to seven tons per acre. The residual effect of alfalfa is about equal to twelve tons of manure in the production of beets. Potatoes grown on alfalfa land produced more than twice as many bushels per acre as when grown on land that has never been in alfalfa. All other crops show the same marked increase.

*Thinning Sugar Beets.*—The time of thinning sugar beets greatly affects the yield. Early thinning is always preferable. The following table shows the average yield in tons per acre from beets thinned at different dates:

Average of 5 plats thinned on June 1.....18.8 tons
Average of 5 plats thinned on June 10.....17.5 tons
Average of 5 plats thinned on June 20.....14.5 tons

These results, together with those secured in 1917 and 1918, show conclusively that delayed thinning results in a marked decrease in the yield.

*The Current Cultural Test with Oats and Barley.*—The following table shows the yields per acre of oats and barley under three different systems of land:

| | Oats | Barley |
|---|---|---|
| Average yield from 3 plowed plats | 60.9 | 60.4 |
| Average yield from 3 disked plats | 63.5 | 57.7 |
| Average yield from 3 spring toothed plats | 68.4 | 61.2 |

The results of three years' tests show that plowed land has no advantage over disked corn land for oats or barley, and that disking is much quicker and cheaper.

*Grass Pastures.*—Experiments were conducted during the summer to determine the best mixture of grasses for pasture on irrigated land. No very significant results were secured. English blue grass, brome grass and orchard grass were used in different mixtures. The past summer's results indicate that the use of manure on pasture lands will greatly increase the amount of pasture on a given acreage.

Sweet clover is showing more promise than any other pasture crop. A sweet clover pasture at the station last summer carried approximately four cows per acre during the season. Sweet clover will furnish more pasture during the second season than during the first season after sowing. It has given more pasture per acre at this station than any combination of grasses used.

*Barley.*—Trebi barley is proving a good variety for irrigated land. The yield per acre has been higher than of any other variety used. A rather large amount of Trebi was distributed among farmers in the spring of 1919. The yield in most cases was very satisfactory, being double that of the common barley. Some seed is available for distribution in the spring of 1920.

*Silage Crops.*—A comparison has been made between field corn which yielded 8 to 10 tons per acre, silage corn yielding 14 to 15 tons per acre, but not maturing seed, and sunflowers yielding from 16 to 21 tons per acre. The silage made from sunflowers is less desirable than that made from corn. Dairy cows eat this silage fairly well, however, and their milk flow seems to hold up nearly as well as on corn silage. The station does not advise extensive use of sunflowers for silage where corn can be grown, but suggests a limited use until the farmer

is satisfied as to the relative merits of corn and sunflowers for silage purposes.

*Dairying.*—The station maintains a small dairy herd, milking nine or ten cows. During the past year two pure-bred Holstein cows have been added to the herd. Milk records and butter fat production records are kept and an estimate made of the food consumed. It is planned to develop this dairy herd for demonstration purposes.

*Hogs.*—Three experiments were conducted during the season 1919 to determine the value of alfalfa pasture for hogs supplemented by a grain ration.

Experiment 1: In this test there were three lots of ten shotes each. Lots 1 and 2 had access to one acre of pasture not divided and Lot 3 had access to one-half acre which was divided. Lot 1 was fed corn from a self-feeder while lots 2 and 3 were fed about a 2 per cent ration during the first 60 days and then the ration was gradually increased to 3 per cent at the end of 90 days when they were put on self-feeders the last 30 days.

Lot 1—Self-feeder, one acre pasture not divided.
Lot 2—Limited amount of grain during first 90 days, one acre pasture not divided.
Lot 3—Limited amount of grain during first 90 days, one-half acre pasture divided.

(Results)

| | Lot 1 | Lot 2 | Lot 3 |
|---|---|---|---|
| Initial weight (pounds) | 1209 | 1194 | 1202 |
| Final weight (pounds) | 2661 | 2327 | 2370 |
| Total gains (pounds) | 1452 | 1133 | 1168 |
| Corn fed (pounds) | 5383 | 4376 | 4591 |
| Pounds corn per pound gain | 3.7 | 3.85 | 3.92 |

Lot 1 was on test 90 days while Lots 2 and 3 were on test 120 days.

Experiment 2: Hogs show a decided preference for Turkestan alfalfa. To secure information as to the comparative value of each as a forage for hogs a quarter-acre plat of each variety has been pastured during the past two summers. The same number of uniform shotes were used on each plat and were fed approximately the same amount of corn. The average of the two seasons are as follows: The shotes on Turkestan made 635 pounds and the shotes on common alfalfa made 710 pounds

gain. For each pound of gain made, the shotes on Turkestan were fed 3.06 pounds of corn and the shotes on common alfalfa were fed 2.91 pounds. These results show that Turkestan alfalfa does not have any advantage over common alfalfa as a pasturing crop for hogs.

Experiment 3: A test was conducted to determine the comparative feeding value of soaked whole barley with ground barley for hogs on alfalfa pasture. Spring pigs were used and were fed about a 2 per cent grain ration. The pigs fed soaked whole barley made 349 pounds gain and the pigs fed ground barley made 424 pounds gain. It required 3.29 pounds of soaked whole barley and 2.77 pounds of ground barely respectively per pound of gain.

Feeding experiments are now in progress with 12 lots of 31 lambs each and three lots of 10 steers each. The experiments are to test out different rations made up of different combinations of alfalfa hay, corn silage, corn, cottonseed cake, and the different by-products of the sugar beet industry.

## THE VALENTINE SUBSTATION

The weather conditions in northern Nebraska were unfavorable to the growth of forage crops. The corn crop was the smallest that has been harvested in many years. Cutworms were very numerous so that most of the corn had to be replanted. Labor conditions also made it difficult to secure enough help to do experimental work.

The superintendent, Mr. James Cowan, who had been in service since the installation of the station, resigned October 1 and Mr. E. M. Brouse was appointed to take his place.

A considerable reduction in the live stock at the station was made by selling the older and less valuable cows, by reducing which was not suitable for the development of the dairy herd.

No experimental work can be reported in addition to that the number of hogs on hand, and by selling all young stock to be found in the Thirty-second Annual Report.

## IMPROVEMENTS

The main laboratory unit for the Department of Animal Pathology and Hygiene has been completed and the equipment is being placed in the building. Two additional units are in process of erection. These new units will consist of a hospital building where animals can be cared for, an incinerator and dis-

secting room, and laboratories for the study of different types of animal diseases. The new units will cost approximately $35,000, and should be completed early in the spring of 1920.

The equipment for Agricultural Engineering Hall has been installed, at a cost of approximately $62,000.

The Legislature of 1918 passed a law requiring the University to test the different models of tractors sold in the State of Nebraska. This required the erection of a laboratory building, the building of a cinder track where engines could be run on the road in all kinds of weather, and the development of methods by which the testing could be standardized. A building was erected costing about $3,000. The total expense of this work for the year is estimated at $32,000. The work will be continued for the second semester of the biennium at a much lower cost, estimated at $16,000.

Additional poultry houses were built for a competitive egg-laying contest in which different poultry breeders would furnish a certain number of birds, upon which an accurate record of egg production is to be kept. The cost of this plant is approximately $5,000.

*Improvements at North Platte.*—A poultry plant has also been established at the North Platte Substation, where 1,000 hens are to be kept and an experienced poultry man placed in charge. The poultry house and residence in connection with this plant have cost approximately $10,000.

A horse barn built of concrete has been erected at the North Platte Station, at a cost of approximately $20,000. A residence for the Irrigation Engineer has been erected at that Station, at a cost of $3,400.

The North Platte Station records the loss by fire of a cattle barn costing approximately $5,000.

## CHANGES IN STATION STAFF

Mr. L. W. Chase has resigned as Chairman of the Department of Agricultural Engineering.

Mr. James Cowan has resigned as Superintendent of the Substation at Valentine.

Mr. A. R. Davis has resigned as Assistant in Plant Pathology.

Mr. G. K. K. Link has resigned as Assistant in Plant Pathology and Physiology.

Mr. W. B. Nevens has resigned as Assistant in Dairy Husbandry.

Mr. J. W. Rovner has resigned as Assistant in Dairy Husbandry.

Mr. H. W. Thurston, Jr., has resigned as Assistant in Plant Pathology.

Mr. E. Mead Wilcox has resigned as Plant Pathologist.

Mr. E. M. Brouse was appointed Superintendent of the Substation at Valentine, effective September 1, 1919.

Mr. J. W. Calvin returned from leave of absence with the Army, as Associate Chemist, September 1, 1919.

Mr. Eli Duncombe was appointed Analyst in the Experiment Station, effective September 1, 1919.

Mr. C. H. Heard was appointed Assistant in Rural Economics.

Mr. J. W. Hendrickson was appointed Assistant in Dairy Husbandry, effective September 1, 1919.

Mr. W. J. Loeffel was appointed Assistant in Animal Husbandry.

Mr. C. K. Shedd was appointed Assistant in Agricultural Engineering.

Mr. O. W. Sjogren was appointed in charge of Agricultural Engineering.

Mr. M. H. Swenk was made Chairman of the Department of Entomology.

Mr. H. O. Werner was appointed Assistant Horticulturist.

Mr. C. C. Wiggans was appointed Associate Horticulturist.

## PUBLICATIONS

The publications of the Station since those named in the last Annual Report are as follows:

Thirty-second Annual Report. Presented to the Governor February 1, 1919. 2,000 copies.

Bulletin No. 171 (Valentine Substation Bulletin No. 2). Crop Production in the Northern Sand Hills. By James Cowan. Distributed May, 1919. 3,000 copies.

Bulletin No. 172. Spring Grains in Western Nebraska. By L. L. Zook. Distributed March, 1919. 8,000 copies.

Bulletin No. 173. Supplementary Feeds in Fattening Lambs. By H. J. Gramlich. Distributed July, 1919. 8,000 copies.

Bulletin No. 174. Beef Production. By H. J. Gramlich. Distributed September, 1919. 10,000 copies.

Research Bulletin No. 14. Fusarium Blight of the Soy Bean and the Relation of Various Factors to Infection. By Richard O. Cromwell. Distributed November, 1919. 3,000 copies.

Research Bulletin No. 15. Farm Types in Nebraska, as Determined by Climatic, Soil, and Economic Factors. By R. R. Spafford. Distributed March 15, 1919. 3,000 copies.

Circular No. 6. Dairy Barn and Milk House Arrangement. By J. H. Frandsen and W. B. Nevens. Distributed October, 1919. 8,000 copies.

Circular No. 7. Outline of Object and Plan of the Nebraska National Egg Laying Contest. By F. E. Mussehl. Distributed June, 1919. 5,000 copies.

Circular No. 8. Pure-Bred Sires Effect Herd Improvement. By M. N. Lawritson, J. W. Hendrickson, and W. B. Nevens. Distributed July, 1919. 8,000 copies.

Circular No. 9. Marketing Nebraska Potatoes. By J. O. Rankin. Distributed October, 1919. 7,000 copies.

Circular No. 10. The Nebraska Tractor Law and Rules for Official Tractor Tests. By Board of Tractor Test Engineers, L. W. Chase, E. E. Brackett, O. W. Sjogren; Manager of Tractor Tests, Claude K. Shedd. Distributed December, 1919. 5,000 copies.

## ACKNOWLEDGMENTS

The agricultural press and the daily and weekly newspapers, especially those papers located within the State, have shown their appreciation of the work of the Experiment Station by giving liberal space to experimental work reported and in every way facilitating the extension of useful agricultural knowledge.

# EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

The College of Agriculture made no effort to expand its extension work in 1919. During the previous year, under the emergency due to the war, some forty farm bureaus were organized and extension work started in them. No attempt was made to enlarge this territory, but rather to obtain definite results in counties already organized.

Forty-seven farm bureaus and one district maintained extension work in 1919. They cover an area which furnishes approximately fifty-eight per cent of the wealth of the state produced annually. Although extension work was on a war basis at the beginning of the year but one county discontinued it.

During 1919 the College of Agriculture gave practical assistance to farmers in the following lines: Raising better livestock; formation of co-operative sales pavilions; formation of co-operative wool sales; pest eradication; higher yielding cereal crops and new forage crops; better poultry; farm labor.

Extension work was conducted along the following lines for women in 1919: Food production; food preservation; nutrition; health; labor-saving devices; clothing; accounts; community activities.

Boys' and girls' clubs were formed in many counties, providing profitable summer work for several thousand youngsters. By forming standard clubs, boys and girls obtained free valuable information in raising vegetables, corn, potatoes, calves, poultry, pigs, rabbits, eggs, and in canning, sewing and cooking. In addition to the valuable knowledge of agriculture and home economics, club members received lessons in farm bookkeeping, parliamentary drill, and many of them made good financial profits.

## AGRICULTURAL WORK

*Promotion of Better Livestock.*—To further promote the purebred livestock industry of the state, the Extension Service devoted considerable time to the organization of purebred livestock associations, which are auxiliary organizations within the farm bureaus of the counties. There are now thirty-two such organizations in the state. Extension agents were instrumental in inducing several county farm bureaus to import

purebred breeding cattle. The growing of a better grade of livestock and producing for the breeding market have become well initiated and should make rapid strides during the next few years.

*Livestock Disease Control.*—The efforts of county agricultural agents reduced hog cholera to a minimum in 1919. A large number of farmers have learned to vaccinate their own hogs through demonstrations given by extension agents. In 1919 approximately 55,000 head of hogs were made immune to cholera at these demonstrations, and members of farm bureaus vaccinated 60,000 head more on their own farms. This makes 115,000 head vaccinated under the auspices of farm bureaus and the Extension Service.

Seventy thousand head of cattle were vaccinated against blackleg in 1919 through demonstrations by agricultural agents. Thousands of doses of vaccine were distributeed through the Extension Service, farm bureaus being privileged to obtain vaccine directly from the College of Agriculture. Extension agents are urging the use of the Agressin and Filtrate products, which give permanent immunity with one vaccination.

*Co-operative Organizations.*—The spirit of transacting business co-operatively is strong among Nebraska farmers. The Extension Service assisted in the formation of many co-operative organizations during the year. There are eighty-one such organizations, distributed as follows:

| | |
|---|---|
| Improved livestock breeders' associations | 32 |
| Poultry associations | 9 |
| Grain associations (elevators) | 18 |
| Stock shipping associations | 1 |
| Beekeepers' associations | 2 |
| Potato improvers' associations | 1 |
| County fair associations | 1 |
| Cow testing associations | 1 |
| Sheep breeders' associations | 2 |
| Co-operative creamery | 1 |
| Milk producers' associations | 1 |
| Poison mixing plants (grasshopper bait) | 6 |
| General co-operative associations | 4 |
| Platte Valley mutual dyking association | 1 |

*Co-operative Wool Sales.*—Activities of the Extension Service led the sheep raisers of twenty Nebraska counties to pool their wool in ten sales in 1919. Two hundred thousand pounds were thus assembled at central points, properly weighed,

graded and labeled, so that the buyers could make rapid examinations and buy it properly graded and in large quantities. The result was an average price of forty-eight and one-half cents a pound, or three cents over the average price received in small individual sales. This meant a saving to Nebraska farmers of $6,000 on this one item. Grading and shearing demonstrations were held throughout the state and other work done to encourage more sheep for Nebraska farms.

*Co-operative Sales Pavilions.*—The Extension Service made a survey of community sales associations and pavilions in order that it might further this work. After completing this survey a circular on community sales pavilions was distributed to all field agents. Several new organizations will probably be formed the coming year.

*Pest Eradication.*—Extension work in entomology consisted of control and eradication of pocket gophers, grasshopper control, sugar beet webworm control, and prevention or control of outbreaks of any other injurious insect pests. Gophers alone cause a loss to eastern Nebraska counties of from $50,000 to $100,000 annually. Gopher extermination campaigns were conducted in ten counties during 1919. It is estimated that demonstrations conducted in five counties during the spring of 1919 resulted in a saving of at least $20,000.

Thirty-one thousand acres were freed of prairie dogs in the western part of the state at a cost of $1,676. The estimated value of this work is $136,571. Outbreaks of the sugar beet webworm in the North Platte valley were controlled through the activity of extension agents, working in co-operation with local organizations.

Grasshopper control was continued in the North Platte valley with remarkable success. Five poison mixing plants with a capacity of ten tons each were operated. Three automobile trucks distributed the poison. A carload of white arsenic poison and twenty-five carloads of bran were used in this work. Farmers estimated their 1918 losses from grasshoppers at $1,500,000. This was reduced to a minimum in 1919.

*Agronomy.*—The agronomy extension work in 1919 included projects in soils, field crops, and forage crops. Demonstrations were continued to show the possibility of controlling blowing soils through proper cropping methods. The Extension Service placed large quantities of Nebraska twenty-one, an improved Kherson oats, among farmers. Experiments over a number of years show that this oats yields considerable more

than the ordinary Kherson variety. Assistance was also given in obtaining supplies of Kanred seed wheat in order that farmers might have demonstrations of its superior yielding qualities.

Considerable data have been collected by the Extension Service relative to the merits of sweet clover and methods used by practical farmers. This information was put in circular form for popular distribution. Extension agents did considerable work in promoting sweet clover, as well as sudan grass, cane and millet.

*Poultry.*—Extension work to promote better poultry included the establishment of twenty-nine demonstration farms in seven counties. Regular meetings were held at these farms and the following subjects discussed: Selecting breeders and mating for egg production, incubation, brooding, early hatching, care of young stock, preservation of eggs, infertile egg production, marketing of broilers, caponizing, and culling. The standard-bred poultry project was conducted in a number of counties and resulted in the establishment of many standard-bred poultry farms. The demand for standard-bred poultry has also been increased through the organization of poultry associations as auxiliary organizations of the American Poultry Association. Extension poultry work was conducted in twenty-nine counties, and valuable assistance given in culling demonstrations and creating a desire for the elimination of the non-producing hens.

*Dairying.*—The past year was a trying one for the dairy farmer. The Extension Service gave help in the organization of the cow testing work and in obtaining good dairy stock. Cow testing work was conducted in ten counties, and twenty-five herds containing a total of 265 head tested. During the year twenty-eight demonstration dairy farms were started and excellent results obtained through demonstrations conducted on these farms.

*Agricultural Engineering.*—Agricultural engineering extension work was conducted during 1919 in rural architecture, farm motors, farm machinery, drainage, irrigation, and highways. Valuable aid was given farmers in planning and locating farm buildings. The Extension Service has a large number of building plans which it sends to farmers for a small charge. During the year demonstrations were given and information sent out on the care and operation of farm motors. Also a few tractor short courses were held. The Extension

Engineer and his assistants conducted demonstrational work in twenty-nine counties and on a total of fifty-nine farms.

*Horticulture.*—Extension work was conducted in pruning, spraying and cultivation of old orchards, in the planting, pruning and cultivation of young orchards, in the care of growing grapes and small fruits, in the grading of apples, and in the planting of wind breaks. Forty-three pruning demonstrations were held in seventeen counties and fourteen spraying demonstrations in eleven counties. Eight new home orchards were planned and planted.

During 1919 aid was given potato growers along the following lines: Controlling diseases by seed treatment, improvement by field selection and seed plots, importation of better seed, improvement of potato handling, grading and storage, controlling vine troubles by spraying, seed inspection, and creating out-of-the-state markets. Approximately fifteen carloads of improved seed were imported into the North Platte valley. A supply of seed was also obtained for Hall county. Demonstrations were conducted with this seed, and it is estimated that the imported seed yielded twenty to twenty-five bushels more per acre than the seed potatoes bought through the ordinary channels. The total increased yield in this one county was estimated at 2,000 bushels, worth, at $1.50 a bushel, a total of $3,000.

A seed inspection service was established to aid growers of improved seed. Applications were received for this service from forty-one growers, having a total of 1,360 acres. In the final inspection a total of 554 acres were passed as producing certified seed.

*Labor.*—The agricultural agents in the several counties performed a definite service in supplying farmers with labor during the busy seasons of 1919. Labor bureaus were maintained in each county and in a few counties branch bureaus were established. Approximately 8,000 men were placed on farms through this channel during the year.

*Farm Management.*—Two important lines of work in farm management were conducted during the year. The first was the making of a simple farm record book, generally available for farmers over the state, and the other was that of assisting farmers to obtain fair treatment from income tax collectors in the preparation and auditing of their tax returns. The Nebraska Bankers' Association co-operated in the distribution of the farm record books. A large number of farmers used

these books to keep an account of their receipts and expenditures, and also found them of much value in determining their exact taxable income.

Discrimination against farmers' inventories has caused Nebraska farmers to pay thousands of dollars more income tax than they should have paid. For example, one farmer had an income of $260 in 1918, according to his account books which contained inventories, receipts and expenditures. His inventories were refused by the deputy collectors, however, with the result that he had to pay a tax of $581, more than twice his real income. The refusal of a number of farmers' inventories caused many to question the whole proposition of taking inventories and keeping accounts. Many farmers have begun accounts in the last two years, largely to have them for figuring their income tax. It is for this reason primarily that farm management demonstration workers of the Extension Service devoted considerable time to this phase of the income tax work.

## HOME ECONOMICS WORK

Nine counties and two cities conducted home demonstration work up to July 1, 1919, and seven counties after that time. Five of the seven counties have farm bureaus, and the work in the other two is conducted through homemakers' associations.

Poultry projects were carried on in six counties. In one county a poultry clinic was conducted in the interest of controlling poultry diseases. It was extensively patronized by the people of the county. The work resulted in the organization of a poultry association in one county, and in all counties the work aided materially in increasing the number of standard-bred flocks.

Twelve demonstration gardens were selected in four counties, and conducted under the supervision of the extension horticulturist and the home demonstration agent.

The making of hard cheese was studied in six counties and proved to be a subject of great interest among women. In many localities hard cheese is now being extensively made where it was almost unknown before. One woman sold $175 worth of this cheese in two months and she considers it a much greater money maker and less work than selling cream.

Extensive work in the drying of fruits and vegetables was conducted in six counties. Instruction was given in drying methods and in the making of home equipment. The canning of meat was taken up in eight counties, with good success. Reports show a total of 3,145 quarts of poultry, 4,638 quarts

of beef, 3,416 quarts of pork, and 829 quarts of wild duck canned.

The serving of hot lunches at school was encouraged in seven counties during the year. County superintendents, teachers and parents co-operated in furthering this work. The home demonstration agents conducted eleven training classes for local leaders in this project. They gave thirty-nine lectures or talks, with an attendance of 1,171 and personally conducted nineteen demonstrations with an attendance of 568. Three hundred and fifty-five families are reported to have adopted suggestions given through this work.

*Health.*—Work was conducted in two counties and the cities of Omaha and Lincoln for better health conditions. In one county a child health conference was conducted for a week. Talks on child feeding, child health, stories for children, and home nursing were given at the conference. An exhibit featuring proper clothing, food, breathing, games, diseases, etc., of children was held in connection with the conference. "Better babies" were featured at county fairs, with the assistance of local doctors and nurses. The agents also assisted in organizing seven classes for the Red Cross first-aid work. The Omaha Woman's Club co-operated with the home demonstration agent in holding a child welfare week. Local child specialists lectured to mothers.

*Labor-saving Devices.*—In four counties a feature was made of labor-saving devices for the home. Agents gave demonstrations on the home-made fireless cooker, home-made iceless refrigerator, the home-made scrubbing chariot, the home-made fly trap, and the pressure cooker. A total of eighty-five lectures or talks were given, with a total attendance of 6,704.

*Clothing.*—Community sewing rooms were opened in two cities, and the work conducted through talks and demonstrations to mothers' clubs and other groups. Remodeling and house-dress lessons were given in several counties, the agents suggesting various styles of simple, inexpensive becoming house-dresses. Four counties conducted dress-form schools of one week each. In one county the work took the form of a definite training school for group leaders. A total of 156 dress forms were made.

## BOYS' AND GIRLS' CLUB WORK

One of the big achievements of the year in the Boys' and Girls' Club work was that of making the standard club the basis of all work. This policy, perhaps, meant fewer enroll-

ments, but more effective work. County fairs, state fairs, bankers, business men, corporations, and farmers, were enthusiastic over this type of Extension work. Approximately $15,000 was offered as prizes in boys' and girls' club work during the year. Clubs were organized to grow pigs, calves, vegetables, corn, potatoes, poultry, rabbits, eggs, and in cooking, baking, sewing, canning, garment making. A total of 129 clubs were organized, with a total enrollment of 11,923 boys and girls. The value of the products was $98,807.64, or a net profit to the boys and girls for their summer's work of $47,829.61.

The Boys' and Girls' Pig Club proved to be very popular as well as profitable for its members. About 1,500 boys and girls signified their intention of joining this club in the spring of 1919. Only a few more than half this number, however, met the enrollment requirements, and of this number 193 successfully completed the work.

The first state-wide pig club show was held in connection with the Nebraska State Fair. Five breeds of hogs were represented with a total of eighty-one pigs. Prizes totaling $415 were given. Twenty-three of the juniors' pigs captured prizes in the open classes at the Fair.

The cooking, baking, sewing and canning clubs were popular with the girls. Twenty-nine cooking and baking clubs were formed during the year, with 388 girls completing the work. The sewing project was continued from 1918, when 520 girls enrolled.

According to clubs, enrollments were as follows: Garden, 3,119; corn, 358; potato, 171; canning, 715; poultry, 1,827; pig, 771; garment, 1,699; old sewing, 520; cooking, 2,197; rabbit, 232; egg, 238.

## STATE AND COUNTY FAIR EXHIBITS

The state and county fairs afford an excellent opportunity for conducting Extension work of an exhibit or publicity nature. In 1919 the Extension Service occupied an extra large space in the balcony of Agricultural Hall at the State Fair. The different lines of work occupied one or more booths, and in each booth was one or more specialists to explain the work. By making the exhibits attractive and keeping some one always present to answer questions and explain the work, hundreds of persons were effectively acquainted with the extension activities of the College of Agriculture.

As has been the custom in past years, the Extension Service prepared an exhibit at the College of Agriculture and

sent it to various county fairs. There were two exhibits built up complete in every detail, housed in two tents, and accompanied each by two demonstrators, a man and a woman. This year the exhibits were built up with the idea of suggesting questions with a demonstrator at hand to give answers and explanations. The tents were present at eleven fairs and it is estimated that a total of more than 40,000 persons visited the exhibits.

The Extension Service in 1919 made a special effort to provide judges for livestock and agricultural products exhibited at county fairs. Many inquiries have been received by the College of Agriculture for many years relative to such judges, and the Extension Service undertook to handle this problem. Forty-two of the fifty-nine county fairs held in 1919 were supplied with judges by the Extension Service.

## EXTENSION PUBLICATIONS

The Extension Service publications during 1919 consisted of bulletins, printed and mimeographed, and news articles for daily, country, and farm papers. Five regular printed extension bulletins were issued as follows: No. 51, Raising Dairy Calves; No. 52, Pork and Beef; No. 53, A House for the Farm Poultry Flock; No. 54, Standard-Bred Poultry Pays: No. 55, Some Factors in Milk Production; No. 56, Dig up the Barberries; No. 57, A Several-Purpose Poultry House.

One emergency bulletin was issued under the name, Nebraska Asked to Increase its Wheat Acreage for the 1919 Crop. Numerous mimeographed bulletins were issued. For instance, the following are some which were issued as a part of the home demonstration extension work: Food Outline No. 1: A General Classification of Food Material, Emergency Shelf and Emergency Meals, Woman's Part in Home Butchering, Breakfast Menus, Beverages, the Third Function of Foods, Poultry, Salads, Meats and Vegetables, Recipes for Invalid Cookery, Warm Weather Cookery, Christmas Cakes and Candies, Honey Dishes, Luncheon Dishes, Potato Recipes, Hot Lunches for the Rural Schools.

Two services were maintained throughout the year to supply information to the daily and weekly newspapers of the state. It is felt that the people of the state are entitled to know what the College of Agriculture is doing. It is their institution and some system should be provided for keeping them informed of its activities.

Hence, twice a week the daily newspapers are supplied with stories of the caliber which they print. It is possible, most of the year, to obtain such stories from the extensive activities of the College, the Extension Service, and the Experiment Station. Occasionally, some member of the faculty discusses briefly some pressing problem before the general public. The daily service is exceptionally well received by the newspapers.

A different form of service is maintained for weekly newspapers. A sheet containing six short paragraphs is sent them each week — some 500 of them. This page, called The Extension News Service, is used extensively to advertise bulletins which the College publishes or which the United States Department of Agriculture has for free distribution. This service is widely used by the country weeklies. Farm papers are also supplied with material from time to time, and receive in addition all that is sent to the daily newspapers.

## NEW FARM BUREAU LAW

One of the accomplishments of the year was a law officially recognizing the farm bureau and definitely outlining the method of organization. For some time it had been realized that the old law was inadequate. A copy of the law as amended follows:

### SENATE FILE NO. 172

### A Bill

For an Act to repeal sections 70, 71 and 72, Revised Statutes of Nebraska for 1913, and to provide for county farm bureaus, for the improvement of agricultural methods and production and for co-operation with the State and Federal agencies therein.

*Be it Enacted by the People of the State of Nebraska:*

Section 1. Whenever in any county not less than three hundred bona fide residents of the county who are engaged in farming, or a smaller number, where such smaller number is not less than one-half of the bona fide farmers in any county, shall petition the county board to appropriate a sum of money out of the county general fund for the purpose of promoting improvement in agricultural methods, the production and more economic distribution of the results thereof, and for the purpose of employing and maintaining or assisting in employing and maintaining a county agricultural agent in said county to aid therein, the county board shall set aside annually, from the county general fund such sums of money for use in accordance with this act.

Sec. 2. Whenever the petitioners shall organize themselves into a society known as a Farm Bureau, and shall have been recognized by the Agricultural Extension Service, College of Agriculture, University of Nebraska, as the Farm Bureau of said county, they shall prepare a budget or estimate of the funds necessary for the carrying on of such work within the county. Said budget shall be filed with the County Clerk, and as claims are approved by the Board of Directors of the Farm Bureau and filed with the County Clerk, the County Board shall order warrants to be drawn upon the general fund of said county in payment of such claims. The total amount so appropriated and paid out shall not exceed an amount equal to one-mill levy on the assssed valuation of the property of the county, and in no instance more than five thousand dollars.

Sec. 3. The selection of the county agent or other persons hired by the farm bureau, and the direction of their work, shall rest with the executive board of the county farm bureau. The county agricultural agent shall aid in the organization and direction of agriculture in the county where he is employed and shall co-operate with individuals, agricultural clubs, and other associations and organizations whose object is the betterment of rural conditions throughout the county.

Sec. 4. The president and secretary of the county farm bureau shall file with the county clerk on or before January 1st of each year a report of their work with a sworn itemized statement of their expenditure under this act.

Sec. 5. Any public official refusing or neglecting to obey the provisions of this act shall be subject to removal from office and shall be deemed guilty of a misdemeanor, and on conviction thereof shall be subject to a fine of not less than fifty dollars nor more than one hundred dollars.

Sec. 6. That sections 70, 71 and 72, Revised Statutes of Nebraska for 1913, are hereby repealed.

# THE AGRICULTURAL EXPERIMENT STATION OF NEBRASKA

## FINANCIAL STATEMENT

### HATCH FUND

#### Receipts

Received by the University (State) treasurer from the treasurer of the United States, installment for the fiscal year ended June 30, 1919, under the act of Congress approved March 2, 1887, (Hatch fund) ..... $15,000.00

#### Expenditures

| | | |
|---|---|---|
| Salaries | | $ 6,453.33 |
| Labor | | 4,034.01 |
| Publications | | 1,395.84 |
| Chemicals and laboratory supplies | | 323.32 |
| Seeds, plants, and sundry supplies | | 72.23 |
| Feeding stuffs | | 1,887.63 |
| Library | | 8.45 |
| Tools, machinery, and appliances | | 554.18 |
| Furniture and fixtures | | 156.85 |
| Scientific apparatus and specimens | | 114.16 |
| | $15,000.00 | $15,000.00 |

J. S. DALES,
Financial Secretary.

January 15, 1920.

## FINANCIAL STATEMENT—Continued

### ADAMS FUND

#### Receipts

Received by the University (State) treasurer from the treasurer of the United States, installment for the fiscal year ended June 30, 1919, under the act of Congress approved March 16, 1906, (Adams fund) ..... $15,000.00

#### Expenditures

| | | |
|---|---|---|
| Salaries | | $ 9,328.21 |
| Labor | | 2,119.57 |
| Postage and stationery | | 40.94 |
| Freight and express | | 205.24 |
| Chemicals and laboratory supplies | | 202.48 |
| Seeds, plants, and sundry supplies | | 534.72 |
| Feeding stuffs | | 1,191.04 |
| Tools, machinery, and appliances | | 317.30 |
| Furniture and fixtures | | 20.64 |
| Scientific apparatus and specimens | | 215.28 |
| Live stock | | 611.47 |
| Traveling expenses | | 186.73 |
| Buildings and land | | 26.38 |
| | $15,000.00 | $15,000.00 |

J. S. DALES,
Financial Secretary.

January 15, 1920.

## FINANCIAL STATEMENT—Continued

### SUPPLEMENTAL FUNDS

#### Receipts

Money received by the University (State) treasurer from other sources than the United States, for the use and benefit of the Experiment Station and Substations, for the year ended June 30, 1919:

| | State appropriation | Sales | Total |
|---|---|---|---|
| Balance on hand July 1, 1918 | $14,822.97 | $16,875.57 | $31,698.54 |
| Receipts | 22,000.29 | 34,611.87 | 56,612.16 |
| | $36,823.26 | $51,487.44 | $88,310.70 |

#### Expenditures

| | | | |
|---|---|---|---|
| Salaries | $ 4,243.33 | $ 1,039.43 | $ 5,282.76 |
| Labor | 5,418.23 | 2,201.56 | 7,619.79 |
| Publications | 1,397.04 | 3.21 | 1,400.25 |
| Postage and stationery | 86.41 | 566.19 | 652.60 |
| Freight and express | 25.69 | 776.50 | 802.19 |
| Heat, light, water and power | 64.60 | 466.10 | 530.70 |
| Chemicals and laboratory supplies | 227.72 | 1,578.09 | 1,805.81 |
| Seeds, plants, and sundry supplies | 1,203.93 | 5,199.73 | 6,403.66 |
| Fertilizers | 255.50 | | 255.50 |
| Feeding stuffs | 1,478.28 | 23,840.24 | 25,318.52 |
| Library | 14.53 | 110.29 | 124.82 |
| Tools, machinery, and appliances | 187.39 | 1,559.18 | 1,746.57 |
| Furniture and fixtures | 727.20 | 925.98 | 1,653.18 |
| Scientific apparatus and specimens | 155.50 | 764.51 | 920.01 |
| Live stock | 1,000.00 | 5,164.87 | 6,164.87 |
| Traveling expenses | 827.63 | 637.36 | 1,464.99 |
| Contingent expenses | 14.95 | 165.28 | 180.23 |
| Buildings and land | 10,671.28* | 463.70 | 11,134.98 |
| Balance June 30, 1919 | 8,824.05 | 6,025.22 | 14,849.27 |
| | $36,823.26 | $51,487.44 | $88,310.70 |

*Includes $10,343.21 spent from State Activities fund for Experimental Fruit Farm (Special State Appropriation).

J. S. DALES,
Financial Secretary.

January 15, 1920.

## FINANCIAL STATEMENT—Continued

### APPROPRIATIONS BY THE STATE

| Experimental Substations | | | |
|---|---|---|---|
| Balance July 1, 1918, of legislative appropriation of 1917 from the State general fund for the benefit of the Experimental Substations, for the two years ending March 31, 1919— | | | |
| North Platte | $27,799.39 | | |
| Scottsbluff | 4,503.67 | | |
| Valentine | 3,223.80 | $35,526.86 | |
| Legislative appropriation of 1919 for two years ending March 31, 1921— | | | |
| North Platte | $30,000.00 | | |
| Scottsbluff | 3,600.00 | | |
| Valentine | 5,000.00 | 38,600.00 | |
| Expenditures, year ending June 30, 1919, for superintendence, supplies, labor, live stock, feed, seeds, machinery, tools, and betterment of the plants— | | | |
| North Platte | $41,023.75 | | |
| Scottsbluff | 5,361.40 | | |
| Valentine | 5,772.11 | | $52,157.26 |
| Appropriations balances June 30, 1919— | | | |
| North Platte | $16,775.64 | | |
| Scottsbluff | 1,462.40 | | |
| Valentine | 3,731.56 | | 21,969.60 |
| | | $74,126.86 | $74,126.86 |
| Balance, cash, July 1, 1918 | | | $21,912.86 |
| Receipts, year ended June 30, 1919 | | | 46,858.24 |
| Expenditures, year ended June 30, 1919 | | $28,452.20 | |
| Balance, June 30, 1919 | | 40,318.90 | |
| | | $68,771.10 | $68,771.10 |

J. S. DALES,
Financial Secretary.

January 15, 1920.

## FINANCIAL STATEMENT—Concluded

### APPROPRIATIONS BY THE STATE—Concluded

Agricultural Extension

| | | |
|---|---|---|
| Balance, July 1, 1918, of legislative appropriation from the State general fund for maintenance of Agricultural Extension and Farmers' Institutes, for the two years ending March 31, 1919 | $35,290.38 | |
| Legislative appropriation for two years ending March 31, 1921 | 54,000.00 | |
| Expenditures, year ending June 30, 1919, for superintendence, clerical service, labor, lecturers' and workers' services, expenses and printing | | $45,697.19 |
| Appropriation balance July 1, 1919 | | 43,593.19 |
| | $89,290.38 | $89,290 38 |

J. S. DALES,
Financial Secretary.

January 15, 1920.

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